

CLAIMS

What is claimed is:

1. An electronics assembly for monitoring and alerting persons to the spoilage of perishable products, comprising:

5 One or more oscillators or time-bases, and

 One or more batteries or energy cells, and

 An electronic monitoring and/or timing circuit, and

 One or more indicators, wherein:

 Each of said oscillators or time-bases and each of said monitoring and/or

10 timing circuits is powered by said one or more batteries or energy cells, and

 each of said indicators is connected to said electronic monitoring and/or

 timing circuit, so that said assembly functions to perform time and/or time-

 temperature measurement and to provide alarm status at said one or more

 indicators when calculated alarm event times occur.

15 2. The invention of Claim 1 that is incorporated into a label.

 3. The invention of Claim 1, wherein the oscillator or time-base is temperature variable.

 4. The invention in Claim 1, wherein the oscillator or time-base is fixed-frequency.

 5. The invention of Claim 1, wherein the oscillator or time-base is able to be

20 calibrated at the point of manufacturing.

 6. The invention of Claim 5, wherein the calibration is achieved with a memory register and capacitor summing technique.

7. The invention of Claim 1, wherein the oscillator or time-base is a ring-type resonant circuit.
8. The invention of Claim 1, wherein the oscillator or time-base employs a silicon-based resonant circuit.
- 5 9. The invention of Claim 1, wherein the oscillator or time-base employs a resonant crystal.
10. The invention of Claim 1, further comprising one or more audible alarm devices.
11. The invention of Claim 1, wherein the electronic monitoring and/or timing circuit is capable of measuring temperature.
- 10 12. The invention of Claim 1, wherein the electronic monitoring and/or timing circuit contains a microcontroller and stored program codes.
13. The invention of Claim 1, wherein the electronic monitoring and/or timing circuit is incorporated into one or more integrated circuits.
14. The invention of Claim 1, wherein the indicator or indicators are LEDs.
- 15 15. The invention of Claim 1, wherein the indicator or indicators are LCDs.
16. A label for monitoring and alerting persons to the spoilage of perishable products, the label comprising an electronics assembly and an outer label cover, the electronics assembly comprising:
- 20 One or more oscillators or time-bases, and
- One or more temperature sensing elements, and
- One or more batteries or energy cells, and
- An electronic monitoring and/or timing circuit, and
- One or more indicators, wherein:

Each of said oscillators or time-bases and each of said monitoring and/or timing circuits is powered by said one or more batteries or energy cells, and each of said indicators is connected to said electronic monitoring and/or timing circuit, so that said assembly functions to perform time and/or time-temperature measurement and to provide alarm status at said one or more indicators when calculated alarm event times occur.

17. The invention of Claim 16, wherein the oscillator or time-base is temperature variable.

18. The invention in Claim 16, wherein the oscillator or time-base is fixed-frequency.

19. The invention of Claim 16, wherein the oscillator or time-base is able to be calibrated at the point of manufacturing.

20. The invention of Claim 19, wherein the calibration is achieved with a memory register and capacitor summing technique.

21. The invention of Claim 16, wherein the oscillator or time-base is a ring-type resonant circuit.

22. The invention of Claim 16, wherein the oscillator or time-base employs a silicon-based resonant circuit.

23. The invention of Claim 16, wherein the oscillator or time-base employs a resonant crystal.

24. The invention of Claim 16, further comprising one or more audible alarm devices.

25. The invention of Claim 16, wherein the electronic monitoring and/or timing circuit is capable of measuring temperature.

26. The invention of Claim 16, wherein the electronic monitoring and/or timing circuit contains a microcontroller and stored program codes.

27. The invention of Claim 16, wherein the electronic monitoring and/or timing circuit is incorporated into one or more integrated circuits.

5 28. The invention of Claim 16, wherein the visual indicator or indicators are LEDs.

29. The invention of Claim 16, wherein the visual indicator or indicators are LCDs.

30. A time-temperature integrator comprising an electronics circuit assembly, said circuit assembly comprising:

One or more oscillators or time-bases, and

10 One or more temperature sensing elements, and

One or more batteries or energy cells, and

An electronic monitoring and/or timing circuit, and

One or more indicators, wherein:

Each of said oscillators or time-bases and each of said monitoring and/or

15 timing circuits is powered by said one or more batteries or energy cells, and

each of said indicators is connected to said electronic monitoring and/or

timing circuit, so that said assembly functions to perform time and/or time-

temperature measurement and to provide alarm status at said one or more

indicators when calculated event times occur.

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31. The invention of Claim 30, wherein the oscillator or time-base is able to be calibrated at the point of manufacturing.
32. The invention of Claim 31, wherein the calibration is achieved with a memory register and capacitor summing technique.
- 5 33. The invention of Claim 30, wherein the oscillator or time-base is a ring-type resonant circuit.
34. The invention of Claim 30, wherein the oscillator or time-base employs a silicon-based resonant circuit.
35. The invention of Claim 30, wherein the oscillator or time-base employs a resonant
10 crystal.
36. The invention of Claim 30, further comprising one or more audible alarm devices.
37. The invention of Claim 30, wherein the electronic monitoring and/or timing circuit is capable of measuring temperature.
38. The invention of Claim 30, wherein the electronic monitoring and/or timing
15 circuit contains a microcontroller and stored program codes.
39. The invention of Claim 30, wherein the electronic monitoring and/or timing circuit is incorporated into one or more integrated circuits.
40. The invention of Claim 30, wherein the indicator or indicators are LEDs.
41. The invention of Claim 30, wherein the indicator or indicators are LCDs.

42. A method of performing time-temperature integration entirely within an integrated circuit, the method comprising:

Providing a temperature-variable oscillator or time-base;

Counting cycles of said oscillator within a logic circuit to determine when one

5 or more preset total cycle counts is/are reached; and

Signaling when said total cycle count(s) is/are reached.

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